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Gas Journal

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Vol. 236. 93rd Year. LONDON, OCTOBER 8, 1941. Registered as a Newspaper No. 4090. Price 1/-

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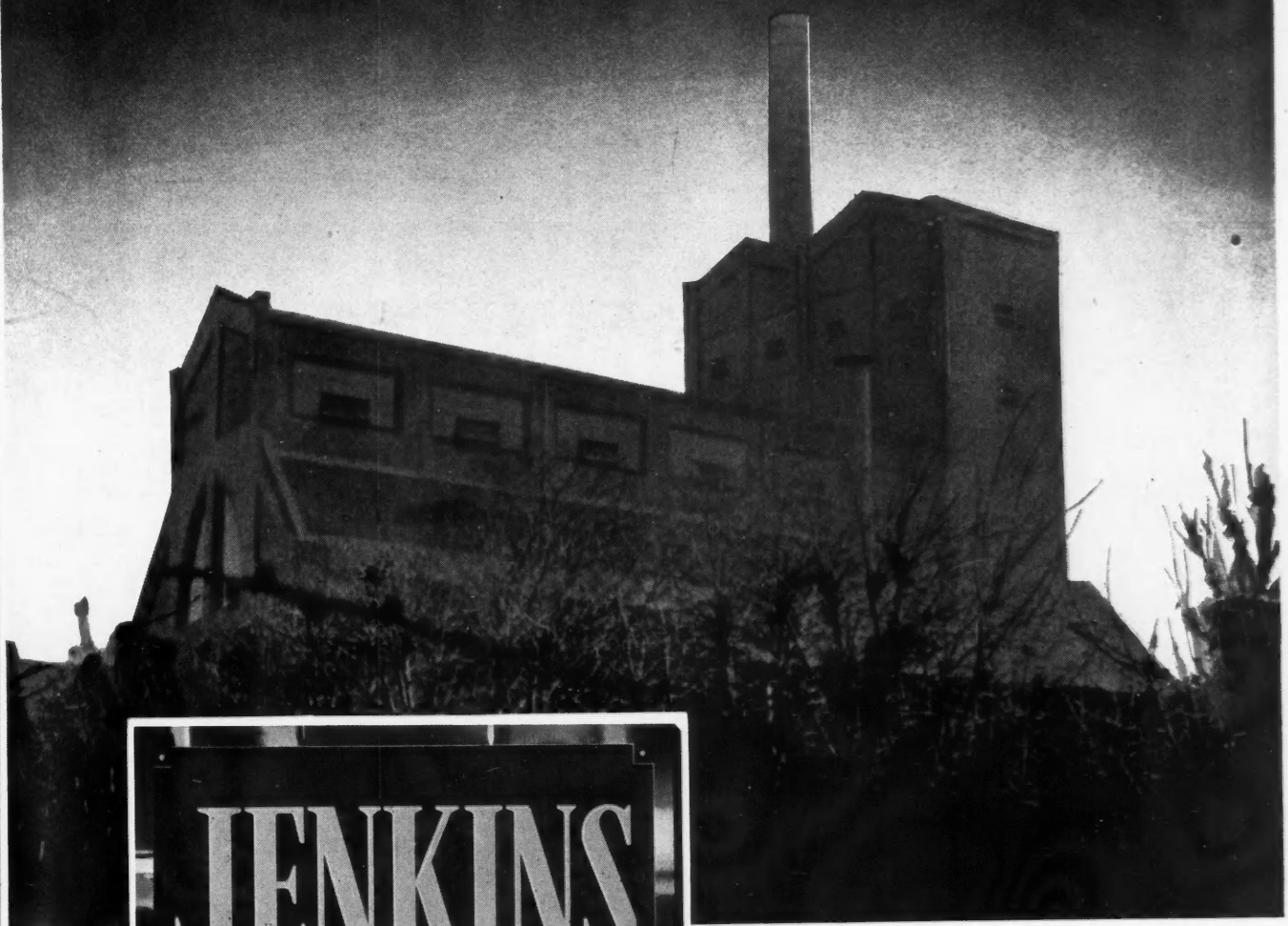

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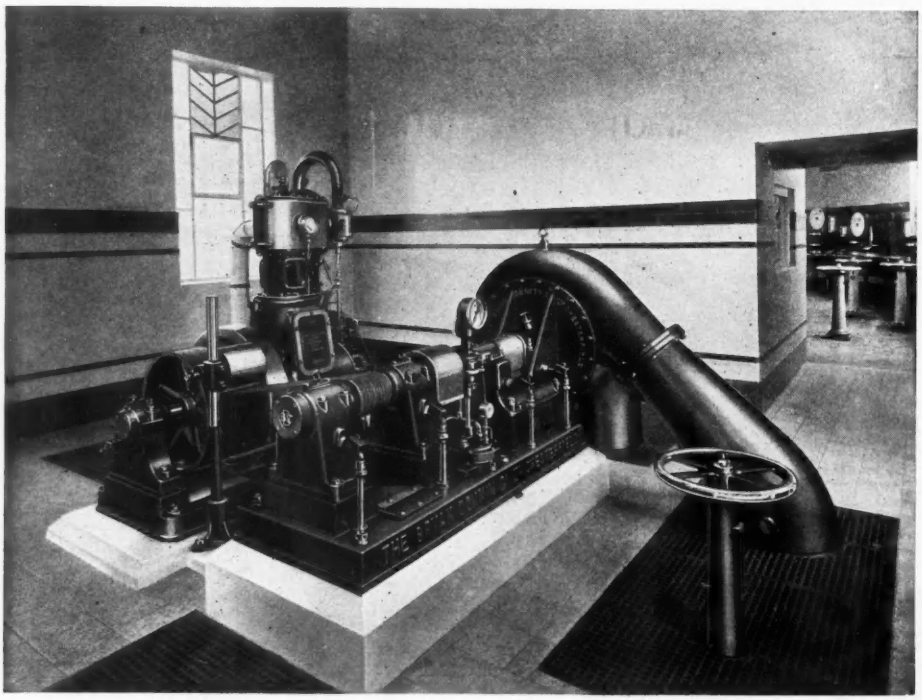

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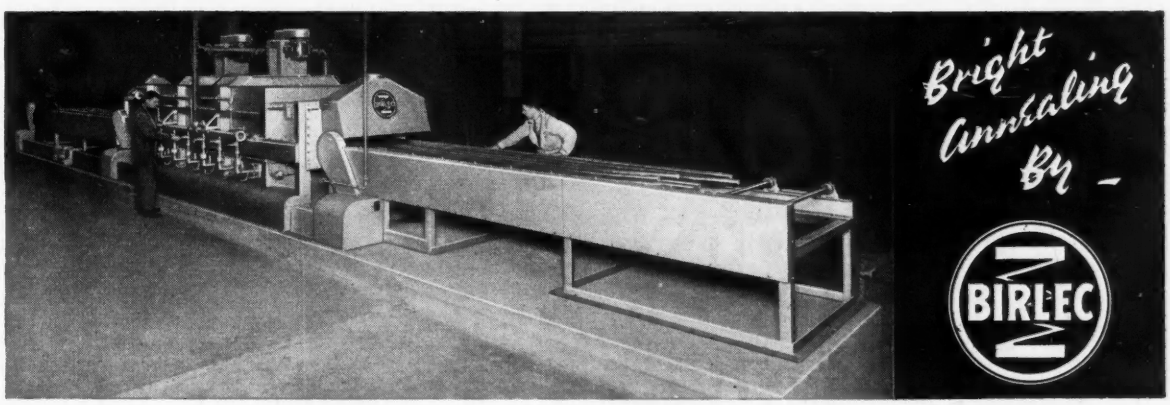

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No. OF METER
Maker's 298145
Company's —
Measuring capacity per hour
READING OF INDEX at time of examination
30
73,600
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For accuracy of registration Correct
For internal soundness Correct
Other defects
Date of Meter 1867
Witness my hand.
TESTING FEE, £— 1/ —
Inspector of Weights.
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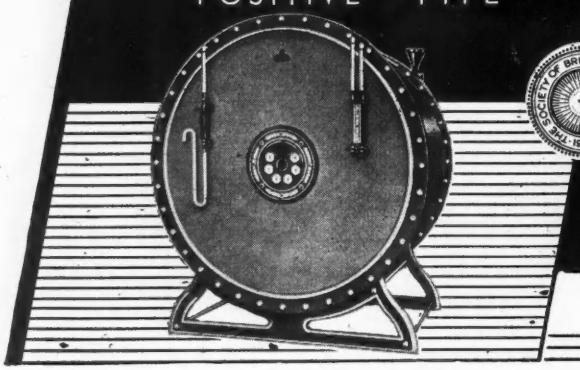

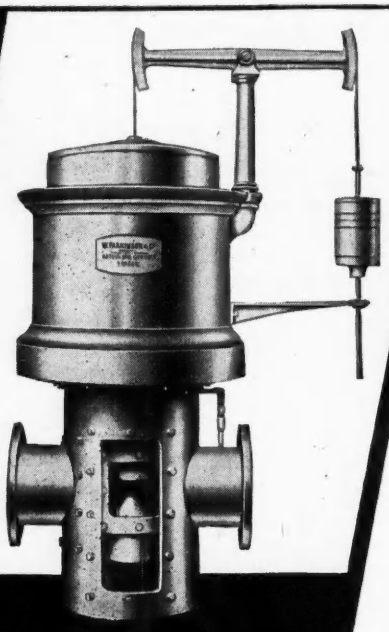

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P.6

GAS JOURNAL, OCT. 8, 1941

VOL. 236 93rd YEAR No. 4090

A DIRECTOR-GENERAL OF GAS SUPPLY

DR. E. W. SMITH, C.B.E. (released by the Woodall-Duckham Companies), will be Director-General of Gas Supply.

This one brief sentence appears to us to be the keynote of the Board of Trade announcement published in other columns of this issue. Unless we are much mistaken, the announcement will prove to have been, for better or for worse, a turning-point in the history of the Gas Industry. We have designated Dr. Smith's appointment as the keynote because whoever in the past has either agreed or disagreed has at least had no doubt about what were the policies of the new Director-General. When we look at the names of his assistants in the new Office, we have no reason to suppose that they will wish to influence him in any contrary direction, so we may well assume that we all know exactly where we stand.

It would not always be playing the game to confront with his past pronouncements a man newly appointed to a position of outstanding responsibility, but we do not hesitate to reproduce on another page part of his contribution to the recent Institution Symposium Discussion. We know Dr. Smith well enough to believe that he would willingly stand by it as an exposition of his views. We do earnestly commend its careful perusal (on p. 53) once again to our readers, and we have no doubt whatever that those who do not by nature live with their heads in the sand—preferring any fate whatever to radical changes—will find a large measure of encouragement in many of its points. What more could we ask as a start than the realization it shows of the immense importance of the fuel industries and of the vital need for a national fuel *policy*; than the demand for improving the Industry's standing in high places lest we be entirely overlooked in future planning; than the plea to evolve our own scheme for living rather than have one thrust upon us by others who might have little understanding of our capabilities and scant sympathy for our past shortcomings?

Recently we used the metaphor of that wartime feature—the queue—to describe our impression that there must sooner rather than later be competition for places in a general rationalization of the nation's fuel resources. The Board of Trade announcement, with its significant transfer to the Board of certain functions in relation to electricity, clearly shows the direction in which matters are moving. At this juncture it would seem to be of paramount advantage both to the nation and to our Industry that the man selected "to advise" is one with such intimate knowledge of gas and its relationship with other industries concerned. The Director-General of Gas Supply, in formulating any demands he may have to make upon the Gas Industry, will at least start with a full realization of what is and what is not possible, and of the difficulties with which the Industry is faced.

Difficulties? Of course we have our difficulties, and we have all realized them more keenly than ever in these hectic days of world war. We do not refer to the day-to-day problem of keeping up the supply of gas however much falls from the skies above and however little comes from the bowels of the earth. What we have in mind is the clear revelation that both to-day and to-morrow call for an organization which does not exist, and for which no mere improvization would be a substitute, and so, it must be confessed, even in the midst of all the day-to-day demands we have been running round seeking rather desperately a solution of a problem which has existed in the minds of practically everybody, yet which scarcely anybody could define with any precision.

Will the Director-General prove to be the answer to the Industry's rather vague prayer? Even in these days when we speak so much of democracy, he has not been elected by the vote of the Industry. We may not by any means all be pleased with the things he does. We have no idea what his powers will be. But we do believe that his appointment will serve to focus many of the troubles that have been both indefinably and more definitely troubling us, and that it will undoubtedly result in our shaping a course in one direction or another. He, too, will have his difficulties, but, knowing in advance what they will be, he will be more than half-way towards overcoming them. He will need the whole Industry's help, but we say this in no tone of sympathy, because doubtless he will be in a position to demand it. What is much more to the point, we believe that the Industry will freely offer all that it has to give, and with a feeling very like relief, will realize that action is going to take the place of the uneasy sensation of floundering which, as we recently pointed out, assailed it no less in the war of 1914–18 than in this one.

Until more is revealed of future plans, further comment would be not only superfluous, but would even savour of "contempt of court." We have said enough to indicate our opinion that the Gas Industry is in exactly the mood to accept with gladness a Director-General of Gas Supply, or any other measure which showed promise of enabling it really and truly to unite in planning for the future. When the Director-General is a man who has delved so deeply into gas problems—both technical and administrative—as has Dr. E. W. Smith, he can be assured of whole-hearted co-operation and support. The one possible danger we can foresee is that the Industry might thereupon be tempted to sit back with a feeling of shifted responsibility. As we have said, the Director-General will need all the help he can have; we believe he can be relied upon to see that this danger does not materialize.

CALORIFIC VALUE

OUR recent comments on the subject of calorific value have given rise to some interesting correspondence, and in one letter the writer asks us what we think about the suggestion "to reduce declared values all round on the same lines as the Order of the last war." Well, with benzole extraction and the difficulties in obtaining adequate supplies of coal the tendency during the present war has been to reduce declared values; during the past six months there have in fact been several instances of this. The whole situation at the beginning of the last war was, of course, very different. The candle-power standard was the order of the day, and it was soon apparent that this standard must be replaced by one based upon the heat content as distinct from the illuminating value of gas. In 1914 there was long and full argument over the Gas Light & Coke Company's Bill, which served as a model to other promoters, who agreed to abide by the decision arrived at. The illuminating standard disappeared. In substitution appeared a standard of 540 B.Th.U., with a "penalty line" at 500 B.Th.U.; and during the early part at any rate of the war the standard in general adopted was round about 500 B.Th.U.

The last war, too, saw very great development in the use of blue water gas generated in separate plants for dilution purposes, and also in the application of steaming to vertical retorts. In regard to the latter, 1917 was a notable year. The Government urged benzole washing and its request was, of course, as in the present war, implemented. It also urged the production of blue water gas from coke—which from the point of view of benzole extraction was somewhat contradictory. It urged consumers to use gas instead of coal. At the latter end of 1917 there were some outstanding Papers on the application of steaming to continuous vertical retorts, which undoubtedly influenced the tendency to make gas of lower calorific value. The question was discussed from many angles, and the query was raised whether a vertical retort externally heated could be

justified as an efficient generator of blue water gas from the standpoint of thermal efficiency. It was argued that, while it was good economy to use as much as possible of the waste heat in the coke in decomposing steam for water gas manufacture, it was a retrograde step to apply more external heat solely to obtain an additional make of water gas; and it was suggested that the total gaseous output was greater when mixing separately generated blue water gas and that the capital cost of the gas made was less. Twenty-five years have passed since then and the advantages of steaming in continuous vertical retorts have been fully enjoyed. But to our mind, and we have mentioned this point recently in our comments on this complicated problem of declared calorific value, the economic and thermal efficiency aspect of steaming in comparison with separately generated water gas might still have further thought and clarification in the light of the several factors involved.

Wartime conditions set up a state of expediency rather than a state of sound economy. In the circumstances it has already proved expedient in many cases to re-declare at lower calorific values, and it may prove expedient to carry the process further, all factors considered. We can, however, hardly see the need for any general order for reduction of calorific value. The Government wants for essential purposes all the gas it can get, all the benzole, all the coke. These demands, as we have emphasized so often of late, all depend fundamentally on the adequacy of coal supplies. The strength of the Industry very largely lies in the flexibility of its manufacturing process. Within certain limits imposed by distribution facilities and organization it can alter at will the relative makes of gas and coke. It can make more gas at the expense of coke, at the expense of benzole, at the expense of tar. Perhaps this comparative ease of internal manipulation has suppressed recognition of the most important function of the Gas Industry as a national chemical processing industry. Whatever the cause, the fact remains that the Industry's present and potential services to the strength and stability of the nation are not to-day correctly assessed.

COAL

IF these services were rightly appraised, then we think we are right in saying that after the long hours of daylight of the spring and summer there ought not to be a position where many gas undertakings are so deficient—and certainly through no fault of their own—in coal stocks to meet the third winter of war. It may be said that the Gas Industry requires a great deal of coal, but in relation to total output it is in reality small. If we take the latest pre-war statistics, gas-works took about 18 million tons, and electricity undertakings almost 15 million tons, so that in point of consumption there is not such an enormous difference between the two industries. The coals dealt with are admittedly different in type, but we cannot for the moment think that this can have much bearing on winning and transport problems.

As we have recorded, the Mines Department has issued an appeal to domestic users to economize drastically in their consumption of coal, gas, coke, oil, and electricity. With full knowledge and justification we have said how firmly and effectively the Industry is prepared to play its part in the Department's voluntary scheme designed to avert compulsory rationing. On the outbreak of war the Government decided to ration fuels, including gas and coke. Bearing in mind the possible repercussions of the plan, we said at the time that rationing of gas could not be taken as though it was a straightforward issue of economy at the gas burner; and our point remains that it is in the best interest of the nation that coal should be used wisely, and that the valuable products which it contains and can yield on carbonization should be put to good use. That to us seems to be true national economy. At the end of 1939 the suspension of rationing of gas and coke was announced, though the Government retained in skeleton form its existing machinery. Now, once again, compulsory rationing, if not in the forefront, is at least at the background of the picture. For our part—and we say this in no spirit of partisanship—we contend that compulsory fuel rationing would be a waste of disproportionate and complicated effort—apparently so from observation of the coal situation to-day.

In 1918 the Coal Controller—in spite of the fact that the Explosives Supply Department was asking gas-works for greater outputs of benzole and other substances required for war purposes—asked in effect for the lessening of the use of coal at gas-works. In March of that year a crude rationing scheme for gas was introduced. At the end of June there had been reductions of domestic gas consumption; there had also been a considerable return to the burning of coal. Another scheme was formulated; by September extraordinarily complicated machinery and forms were ready to give effect to the Fuel and Lighting Order, the detail of which was overpowering. As a matter of fact, in order to enlighten the public on the Order the British Commercial Gas Association spent about £3,000. Fortunately Nov. 11 brought a different complexion on this matter, as on many other problems.

We return to the present coal position. In the House of Lords last Wednesday Lord Templemore stated that special efforts were being made to safeguard the position of public utilities. The coal stocks of the water undertakings, he said, were such that their position might be regarded as fully safeguarded against possible interruption of supplies in the coming winter. The tonnage in stock for electrical undertakings, he continued, was only a little below the "exceptionally high" figure of a year ago, and reserves were fairly evenly distributed throughout the country. But he admitted that the position of the Gas Industry was less satisfactory—that "the present inadequate stocks at a number of individual works must be a matter of serious consideration." Intensive efforts, he added, were being made to secure a "reasonably secure position before the winter." The Gas Industry has responded to every call made upon it, and it seems to us peculiar that even now it is regarded as a Cinderella, as it has been so regarded practically continuously throughout the present century. We look to a brightening of the picture. Certainly only the direst of necessity could justify the putting into action of a general fuel rationing scheme.

Control of Coal Tar Order, 1941

The Secretary for Mines has, in pursuance of paragraph 3 of the Control of Coal Tar Order, 1941, issued a Direction in respect of coal tar acids which will come into operation on Oct. 13. Under the Direction no "Distiller" or "Importer" may dispose of coal tar acids except under the authority of a licence. For definition of "Distiller" or "Importer" see paragraph 11, S.R. & O. 1941, No. 81, Control of Coal Tar Order, 1941, dated Jan. 20. Coal tar acids for the purpose of the Direction are defined as: "The constituents of coal tar or of the distillates from coal tar which are soluble in aqueous caustic soda solution, and cresols and xylenols derived from any source other than coal tar." The Direction excludes phenol, and phenol mixtures containing more than 80% of phenol, the disposal of which was brought under licence, by means of a Direction made by the Secretary for Mines, on March 26, and which came into operation on April 14.

A Meeting of the Yorkshire Junior Gas Association will be held on Nov. 1 at Bradford, when a Paper will be read by Mr. D. C. Gunn on "The Internal Combustion Engine and Gaseous Fuel."

A Meeting of the Illuminating Engineering Society will be held on Tuesday, Oct. 14, at 2, Savoy Hill, W.C. 2, when Mr. W. J. Jones will deliver his Presidential Address.

Meetings of The Institution of Gas Engineers are provisionally arranged to be held on Monday, Oct. 13, as follows: 1.45 p.m., Finance Committee; 2.15 p.m., Membership Committee; 3.15 p.m., Benevolent Fund Committee of Management; 4 p.m., Publications Committee.

The Fourth Hinchley Memorial Lecture will be delivered before the Institution of Chemical Engineers by Sir Richard A. Gregory, Bart., F.R.S., on "Scientific Knowledge and Action." The lecture will be given in the Reading Room of the Institution of Civil Engineers, Great George Street, Westminster, S.W. 1, on Friday, Oct. 24 at 2.30 p.m., the President, Mr. C. S. Garland, presiding. Non-members will be welcome to attend the lecture, for whom tickets may be obtained on application to the Assistant Secretary.

A Meeting of the Gas Education Committee of The Institution of Gas Engineers will be held at 1, Grosvenor Place, London, S.W. 1, on Tuesday, Oct. 21, at 2 p.m. The main item for consideration by the Committee is the Paper on "Academic and Technical Education in the Post-War Gas Industry" by Mr. John Terrace (Chairman of the Gas Education Committee) presented at the meeting on June 11. The Meeting of the Gas Education Executive Committee which was to have been held on that day has been cancelled.

DIRECTORATE OF GAS SUPPLY

BOARD OF TRADE ANNOUNCEMENT

As has been announced, an Order in Council was signed on Sept. 11 transferring to the Board of Trade the functions in relation to electricity previously exercised by the Minister of War Transport. At the same time the Board have had under review the reorganization required for the exercise of their functions in relation to the Gas Industry.

It has been decided to set up:

(i) A new Division in the Industries and Manufactures Department (to be known as I. & M. Div. III) to carry out the Board's functions in relation to both industries. Sir Arthur Eborall will be Principal Assistant Secretary of the Division and Mr. A. J. Cousin, Assistant Secretary; and

(ii) A Directorate of Gas Supply—

(*a*) To deal with immediate questions relative to the public supply of gas to nationally essential factories;

(*b*) to advise on the steps to be taken to secure the progressive development of the Industry as a public service.

Dr. E. W. Smith, O.B.E. (released by the Woodall-Duckham Companies), will be Director-General of Gas Supply. He will have the assistance of Mr. J. F. Ronca, Mr. G. Evetts, and Mr. P. Chantler.

"THE PROBLEM"

The views of Dr. E. W. Smith, C.B.E., newly appointed Director-General of Gas Supply at the Board of Trade, on problems concerned with the organization of the Gas Industry, are generally well known. It is interesting, however, to recall his most recent public expression of some of them, and we make no apology for reprinting the admirable summary which he gave in his contribution to the Institution Symposium Discussion in June:

"I am not alone," said Dr. Smith, "in believing that the Industry is at the parting of the ways. We can continue the old order, each undertaking being a law unto itself, happily collaborating, on occasions, with other undertakings, taking the advice of the National Bodies, or not, as in their wisdom they may so decide, or we can become a thoroughly co-ordinated Industry. If we continue as now I see no satisfactory future for it. If we are prepared to accept radical changes I am confident of the future.

"But what will such changes entail? The answer to that question depends on the National Fuel Policy. We should insist, by every means in our power as individuals, that the Government should formulate its policy concerning fuel and power. It is conceivable that more is 'in the wind' than we know. It is possible that at any time we may hear that there has been formed a Ministry of Fuel and Power. Such a Ministry would presumably take over the powers now vested in the Ministry of Mines, the Ministry of Transport and the Board of Trade, so far as they concern coal and electricity and gas. I believe that a Ministry of Fuel and Power, if formed, should be the most important Ministry of the Government so far as our natural resources are concerned. But how shall we stand under such a régime? Rightly or wrongly I have formed the impression that the standing of the Industry in Government quarters is not nearly as high as it should be. As an Industry I am afraid we count for too little. We are not held in sufficient respect, and I believe it is largely our own fault. We are still little more than a loose aggregation of individual independent entities. We are not, except as a courtesy, a truly National Industry. Colonel Carr and others have described from time to time the possibilities of 'Regionalizing,' 'Gas Boards,' &c., and I, among many others in the country, had hoped that our National Organizations would, by this time, have formulated far-reaching proposals for the administration and financial control of the Industry. It would have been better to be ready with our own scheme rather than to have one imposed upon us. This, I am afraid, will be the case. I believe that Gas Commissioners are inevitable. Cannot we steer them the way we should like them to go?

"The Gas Industry is buying its raw material from a Government-backed coal industry, transporting its raw material on what is likely to be in the future a Government-controlled railway system. Our Industry is limited in its freedom by Government Departments and selling against Government-backed products—electricity and oil. Can it be hoped that we can possibly evolve economically and hold our proper place as unco-ordinated undertakings?

"That is the problem. What are we going to do about it?"

Personal

Mr. J. E. TRIGGS, late of the Staveley Coal and Iron Co., Ltd., has joined the outside technical staff of Messrs. Clapham Brothers, Ltd., gas, chemical, and constructional engineers of Keighley, Birmingham, and Paisley.

* * *

In recognition of his valued services to the Cornish Gas Association—covering a period of membership of over twenty years, during which he was President on two occasions—a presentation was recently made by the members to Mr. F. R. G. GRANT, retiring Engineer and Manager of the St. Ives (Cornwall) Gas Department. Mr. Grant has held that position for 21 years with conspicuous success, during which period he has been responsible for a number of innovations which collectively make the St. Ives undertaking one of the most up-to-date in the British Isles. These improvements include a high-pressure gasholder; a high-pressure distribution system feeding at various points throughout the district into low-pressure mains; a new vertical retort installation; high-pressure street lighting in part of the town; and the remainder modernized with new standards and lamps of high candle-power. Gas supply has been extended to Carbis Bay, the popular seaside resort adjacent to St. Ives. The gas output during this time has grown from 12 millions to 45 millions. His many friends in the Gas Industry and elsewhere will wish Mr. Grant many years of health and happiness in his well-earned retirement.

* * *

Mr. Grant's successor at St. Ives will be Mr. J. W. DEAN, who has been appointed Engineer and Manager. Mr. Dean has been Engineer of the Penzance Gas Undertaking for several years.

Obituary

Mr. R. T. SIMPSON, who died in Edinburgh on September 26, was for nearly 35 years travelling representative for Messrs. Peebles & Co., Ltd., Tay Works, Bonnington, Edinburgh. He retired in 1936. Mr. Simpson never spared himself and was out in all weathers, early and late in the day. His long experience and cheerful disposition earned him grateful recognition from gas engineers and managers all over the country. He was a great authority on titles and genealogies, of which he made a life study. For more than 50 years he attended the Wroth Silver Ceremony held at Knightlow Hill in Warwickshire, and wrote many articles and a pamphlet on its origin, reviving and keeping alive a very ancient ceremony which might otherwise have died out. He was a nephew of the late Mr. Peter Simpson, who was very well known to a previous generation of the gas profession. Since retirement Mr. Simpson had been a patient sufferer from rheumatism, brought on by exposure and accentuated by a serious accident when he was knocked down a few years ago and nearly killed by a motor car. Mr. Simpson is survived by his widow and two daughters.

* * *

We regret to announce the death on Friday, Sept. 26, in his 82nd year, of Mr. HENRY ALLCHIN, who was one of the first four employees of Messrs. West's Gas Improvement Company when he entered their service in March, 1874. Mr. Allchin was for many years one of the engineering representatives of the firm, in which capacity he came into contact with many gas undertakings at home and abroad. He retired from active service on Dec. 31, 1931.

Manchester and District Junior Gas Association

There was a large attendance of members at the 43rd Annual General Meeting of the Association, which was held at the Engineers' Club, Manchester, on Saturday, Sept. 27. The meeting was preceded by luncheon.

The President, Mr. H. Platt, gave a résumé of the activities during the session 1940–41, in which he pointed out that by the death of Mr. W. J. Wellens (Wombwell) the Association has lost one of its founders.

Mr. R. L. Greaves had found it necessary to resign from the Council owing to the pressure of other duties, and Mr. E. Bates (Manchester) had been co-opted in his place.

During the past session members had been singularly successful in gaining distinctions and awards, the Gold and Silver Medals of The Institution of Gas Engineers having been awarded to Mr. T. R. Cook (Blackpool) and Mr. R. L. Greaves (St. Helens) respectively, while the Bronze Medal had been awarded to a former member. Awards for gallantry had also been made to various members.

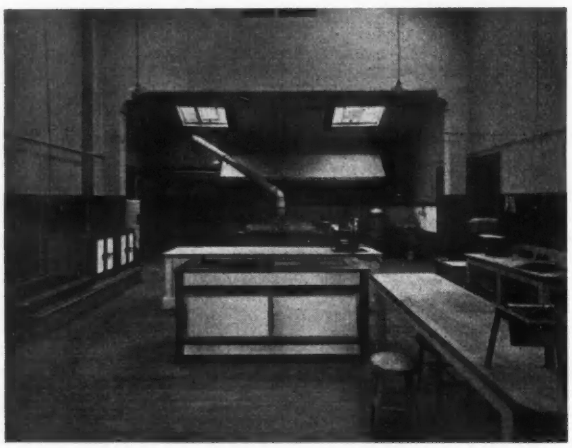
The Treasurer's Statement of Accounts, which showed a credit balance of £122 8s. 9d., was duly adopted.

The following members were elected for the session 1941–42:

President: H. Platt, M.Inst.Struct.E. (Bolton).
President Elect: J. Graham (Lancaster).
Junior Vice-President: H. H. Thomas (Liverpool).
Council: J. Albinson, B.Sc., A.I.C., T. V. Blake, H. Burnet, B.Sc., A.M.I.Mech.E., J. A. Speers, B.Sc.(Eng.), H. H. Thomas, B.Sc., T. Reynolds (Representative of the Manchester District Association of Gas Engineers), E. Bates, T. Cartledge, J. C. Hogg, E. B. Field.
Hon. Treasurer: E. Kenyon.
Hon. Secretary: F. Johnston, F.C.I.S.
Auditors: J. H. Cadman, F. A. Collier.

Southport Civic Kitchen

The accompanying photograph shows a view of the Southport Central Civic Kitchen. All the food is cooked in the central kitchen at the Victoria Hall, and is then distributed in insulated containers to the district community feeding centres, where it is served on the popular American cafeteria system. The majority of the apparatus was supplied by Radiation Ltd. and consists of a "Chester" range, 1 large "Belgravie" hotcloset with bain marie, 1 20-gallon and 1 12-gallon water jacketted boilers, 1 "Vega" and 1 "Rotapan" steamers, 2 20-gallon water boilers and a large "Equator" storage water heater



at the main kitchen. There is also a solid fuel range. At each district feeding centre there is a hotcloset with bain marie top, a large single cooker, a multi-point water heater and 2 10-gallon urns. Originally the equipment was designed to provide 300 to 400 meals per day for the civic restaurants, but the work has been considerably enlarged by the additional work of supplying, under the education authority and the medical officer of health, over 20 schools in the borough with a mid-day meal. The number served is approximately 4000 per week. During the air raids on Merseyside evacuees were fed from the same kitchen, and 24,000 additional meals were prepared. It is anticipated that further centres will be opened in the near future and extra equipment installed.

Facilities for Study Available to Students Serving in H.M. Forces

The Institution of Gas Engineers has been informed by the Director of Army Education that arrangements have been made for students serving in H.M. Forces to continue their studies for professional examinations. These arrangements include the conducting of correspondence courses in certain engineering subjects which may be of interest to students of the Institution serving in H.M. Forces who may wish to continue their studies for the Institution's examinations.

The Gas Education Committee has had an opportunity of studying the syllabuses of the engineering subjects available. After careful review of these it considers that the following subjects are equivalent to the corresponding ancillary subjects of the Institution's Education Scheme :

General Science No. AE3, series E4, is equivalent to Physics S2 and Chemistry S2.

Engineering Science No. AE3, series E3, is equivalent to Engineering Science S2.

Electro Technics No. AE3, series E5, is equivalent to Electrical Engineering S2.

The syllabuses of some of the other subjects—namely, Strength of Materials No. AE3, series E6, Theory of Structure No. AE3, series E7, Theory of Machines No. AE3, series E8, and Steam Engines No. AE3, series E9—are considered to cover a wider ground than that normally required for the ancillary subject examinations in Mechanics and Heat Engines for the Institution's Higher Grade Certificates. If a student is sufficiently far advanced to study any of these additional subjects the Committee considers that he may do so with advantage.

Serving students wishing to study any of these subjects should apply in the first instance to the Commanding Officer of their unit.

In order that serving students may benefit by their studies and obtain exemption from the appropriate ancillary subjects, they will be required to pass either examinations of a recognized Examining Body or examinations set by the Institution. Before concluding a correspondence course in any of the above-mentioned subjects, application should be made to the Secretary of The Institution of Gas Engineers concerning arrangements for examination.

We regret that in the article on "Benzole Recovery by Refrigeration" in our issue of Sept. 17 the diagrams on p. 438 were transposed.

Standard Pots and Kettles

Fewer sizes and shapes of pots, pans, pails, cans, kettles, buckets, and bins made from iron or steel, whether galvanized, japanned, enamelled, or treated in any way, will be available as the result of the Board of Trade's new Hollow-ware (Control of Manufacture) Order, 1941 (S.R.&O. No. 1345), which came into force on Sept. 24. The Order has been made with the object of effecting economies in the use of labour and materials by standardization in manufacture of hollow-ware in general demand, principally for domestic purposes, and it forbids, except under licence, the manufacture, by makers who are on the Home Trade Register, Class 9, of the Limitation of Supplies (Miscellaneous) (No. 11) Order, 1941, of hollow-ware made wholly or mainly of iron or steel. Manufacturers not registered under that Order do not require a licence.

A list of all hollow-ware being manufactured at the present date must be submitted with the licence application, which should be sent immediately to the Board of Trade, Industrial Supplies Department, Millbank, S.W. 1. Directions as to manufacture will be given from time to time. It is anticipated that with the assistance of the trade the supply of essential hollow-ware, subject to the quotas imposed by the Limitation of Supplies Orders, should be more economically and satisfactorily maintained. Standardization is not expected to make fewer goods available to the public. On the contrary, by eliminating a number of sizes and shapes, standardization should make possible the manufacture of larger quantities of goods from given quantities of material. Because of economies to be effected in labour and materials resulting from standardization the effect of the new Order should be to decrease rather than increase prices.

Demonstrations at Brighouse

A series of wartime cookery and fruit bottling demonstrations have recently been held in the Gas Showrooms of the Brighouse Corporation Gas Department and were well attended. The demonstrations were arranged in co-operation with the Ministry of Food, and had been preceded by special film displays by the Ministry of Information on matters dealing with food problems. The Gas Showrooms are continually being utilized as a publicity medium for various efforts—*e.g.*, salvage drives, war weapons weeks, blood transfusion appeals, &c. The Ministry of Information are shortly to use them for an exhibition on " Books and Freedom."

The rear of the showrooms, including the spacious Lecture Room, has been taken over as a British Restaurant, which has been acclaimed by many visitors as being a model of its kind. All the existing coal-burning appliances are fitted with removable gas burners and the whole of the lighting is by switch control burners. The restaurant section is heated separately by a gas-fired boiler, while the water for tea making and washing up is supplied through gas appliances.

Nursery Schools Exhibition in Edinburgh

The formation of Nursery Schools is now engaging the mind of every Local Authority, not as a wartime measure for evacuees, but as a part of the national scheme of education. At the opening ceremony of a recent Nursery Schools Exhibition in Edinburgh, the Right Hon. Sir Henry Steele, Lord Provost of the City of Edinburgh, presided, and was supported by Lady Rosebery, Chairman of the

W.V.S. (Civil Defence) Scotland, and Mr. Leopold Friedman, Technical Director of Ascot Gas Water Heaters Ltd. The exhibit included displays of children being educated in a nursery school, cooking for infants and young children, dietetics in relation to wartime rationing, and a wonderful display of toys made from waste material ready for sale. The exhibition was so successful that it has been decided to send it to America for propaganda purposes. The accompanying photograph shows Sir Henry and Lady Steele, Lady Rosebery and Mr. Leopold Friedman watching a demonstration.

SOME APPLICATIONS OF ELECTRICITY IN THE GAS INDUSTRY*

By P. TURNBULL, *Gas Light and Coke Company*

PRESENT day methods of carbonizing coal have placed at our disposal a form of energy—*viz.*, heat—which, after having performed its primary function, may be got rid of as easily as possible —*i.e.*, up the chimney stack to atmosphere, or, since modern economics veto such action, this otherwise waste heat may be used to generate steam as a further source of power. In many instances, however, this steam as a direct power medium is not economical, and so we come to its use in a prime-mover for conversion to the more adaptable form of electrical energy. I am assuming here that a solid fuel boiler installation is available to take the basic steam load when required.

Time does not permit a detailed description of the electrical generating plant, nor can hard and fast rules be laid down as to the best type and size to use, since each works has its own special requirements.

The problem of whether to utilize A.C. or D.C. depends on:

(*a*) The system of the local electricity supply authority, with whom a small works carrying little or no standby generating plant would need to have an agreement whereby a supply would be available in case of necessity, or the supply authority could take the normal load and leave the works to cater for the emergency periods.

(*b*) The specific purpose for which current is required—*e.g.*, in a horizontal retort installation the stoking machinery is best served by direct current owing to the simpler and wider range of speed regulation which can be obtained, but for conveyor drives, pumps and cranes, polyphase A.C. is much more economical and adaptable. For a vertical retort installation, A.C. can be used almost exclusively.

Nowadays the simplicity and efficiency of rectifying A.C. by means of mercury arc rectifiers make A.C. generation more of a practical possibility than in the past.

This brings me to the first piece of apparatus I feel will prove of interest—namely, the glass bulb type of mercury arc rectifier. When A.C. is used for the main supply system, one of these rectifiers can be installed at a point in close proximity to the plant requiring D.C. This aspect saves heavy feeder cables, as an integral part of the rectifier consists of a transformer which can reduce the higher voltages found advantageous in a polyphase system.

Let me describe, therefore, a rectifier fed from 440 volt, 50 cycle, 3-phase supply and delivering D.C. at 220 volts. The installation consists of three main items: (1) Transformer; (2) rectifier bulb or bulbs; (3) inductance coil. The transformer steps down the voltage to the value required for the D.C. plant. The rectifier bulb converts the alternating current to a uni-directional current—*i.e.*, it acts as a one-way valve which allows current to pass in one direction only. The inductance coil smooths out the pulsations or ripples in the rectified current.

The rectifier bulb is a highly evacuated vessel fitted with a number of electrodes (generally of graphite) (anodes) corresponding to the number of phases to be rectified—*i.e.*, when used on a 3-phase supply, there will be three electrodes—and a mercury pool (cathode). Its action as a one-way valve is due to the uni-directional flow of electrons which takes place in vacuo from the mercury pool to the graphite electrode once an arc has been formed across the mercury vapour, evolved by the striking of such an arc. As a result, the mercury vapour arc in the bulb offers a very low resistance path to the current in one direction (when the anode is positive in respect to the cathode), allowing the current to flow freely in that direction, but an extremely high resistance in the reverse direction, so that current cannot flow back from cathode to anode.

In this way the positive half cycles induced in the secondary winding of the transformer pass through the rectifier bulb, and by suitably arranging the components of the transformer secondary winding full wave rectification is obtained.

The operation of the rectifier may be described as follows: For the rectifier to start functioning as a conductor, the bulb must be filled with ionized mercury vapour; to do this, the bulb is fitted with a starting electrode, which dips into the mercury pool, completing an auxiliary current circuit. This electrode is then released so as to open the circuit, and in the opening to cause an arc, thus initiating the electron flow from the cathode pool. The starting electrode is made to dip and then spring back as required by the action of an electromagnet clamped to it. To maintain an adequate emission of electrons, irrespective of the load on the plant, the rectifier is fitted with an auxiliary circuit designed as the exciter circuit, which passes through the cathode pool the minimum amount of current necessary for this. These exciter electrodes are fed at a low voltage so as to reduce the losses due to this maintaining arc, and the current is limited and adjusted by means of a choke coil in this circuit. For external operation all that is necessary is to close the push button control switch and the rest follows automatically.

Some of the M.A. rectifiers installed at the Company's works are provided with two identical bulbs, each capable of dealing with a load of 100 amps., and so connected that should one fail the other is capable of carrying the entire load; with both bulbs at work, therefore, each bulb is just half loaded, which makes for long life of the bulb, as well as providing an adequate standby in situ. The bulbs, auxiliary transformer for the exciter and control circuits, and the fan for cooling the bulbs, are contained in a sheet steel cubicle. The cubicle is fitted with special withdrawable trays at the bottom so that any dust that has collected may be removed easily.

The efficiency for the 100 amp. size of bulb is 87½%. The power factor is 0.83, and the rectifier is capable of withstanding an overload of 25% for two hours, 50% for ten minutes, and 100% momentarily. It is evident, therefore, that such loads as are encountered when pushing out coke from a retort which is proving stubborn can be conveniently dealt with.

Performance figures:

Load	1½ by F.L.	F.L.	¾ by F.L.	½ by F.L.	¼ by F.L.
Efficiency	87	87.4	87.4	86.7	83.6
Power factor	.83	.83	.82	.80	.80

Magnetic Separators

Another application of electricity which has been found very useful where the handling of large quantities of run-of-mine coal, and of oxide or bog-ore used for purification, are undertaken, is the pulley type of magnetic separator. In spite of the cleaning methods now adopted at most collieries, tramp iron still finds its way into run-of-mine coal; it is found in various forms—*viz.*, pickheads, coupling pins, pieces of chain, clips from the endless rope haulage systems, nuts, bolts, &c.—and if such are not detected and removed before the coal passes into the crushers, considerable damage may result. Again, where oxide is used in any quantity for purifying vessels, and during the time it is lying out for re-vivifying and recuperation after removal from the vessel and before being used again, quantities of tramp iron are often taken up. Before being used again, the oxide is crushed either mechanically or by hand. Where it is crushed mechanically, the same risk of damage to the crushers is present if such tramp iron were allowed to get as far as the crusher unobserved and unchecked.

To have this tramp iron removed by hand would be an arduous process, and then at best very unreliable. Magnetic separators solve the problem simply, efficiently, and economically. The type of separator used in the Company's works in the main stream of coal as it is unloaded from the colliers is used as the head sheave for a 48 in. belt conveyor. The pulley consists of a number of steel discs keyed to a shaft, an electro-magnetic winding being placed between alternate discs. The magnetizing coils are wound on steel bobbins, which are dowelled to the discs to prevent shifting. The coils are all connected in series, and terminal wires are brought through a hole in the centre of the shaft to a pair of collector rings fixed far enough beyond the edge of the pulley to permit the insertion of a bearing between the collector rings and the pulley.

The coils are suitably insulated and impregnated by the vacuum process, and when assembled are as near as possible to the outside face of the pulley. The proper design of a separator to do a certain work efficiently is a nice problem which can be solved only by those who have a theoretical as well as practical knowledge of the art.

The magnetizing of the pulley is accomplished by passing direct current through the windings in the interior of the pulley. The current sets up a magnetic flux which passes through the belt and attracts any iron or steel that may be contained in the material carried by the belt. As a result these pieces are held in contact with the belt until the latter leaves the pulley on the underside. Here they are dropped when they have passed out of the magnetic field, and may be collected in a box, or kept separate by means of a barrier from the other material which is projected beyond the pulley. As has been said, these pulleys can be used to replace the head sheave where a belt conveyor is used, and in such instances it may be imperative to maintain dimensions of the replaced pulley. Since a small pulley is unsuitable for driving long or steep conveyor flights, it will sometimes be cheaper to instal a separator pulley unit, say about 3 ft. long, on to which the main conveyor discharges. This unit can also be used where material is discharged from a chute.

From experience, very little maintenance is required, apart from keeping the rings reasonably clean and free from accumulations of dust, for which most gas-works are noted. In oxide handling plants, of course, there is the ever present bugbear of corrosion, but with reasonable care, and suitable covers, this danger can be cut down to a minimum.

To give some idea of the wattage required for various diameter pulleys and belt widths, some figures published by the manufacturers are given:

Diam. of pulley. in.	Width of belt. in.	Capacity. cu.ft./hr.	D.C. watts required.
12	18	1,400	450
12	36	3,200	950
12	48	4,400	1,300
18	18	2,100	680
18	36	4,800	1,440
18	48	6,600	1,960
30	18	3,500	1,130
30	36	8,000	2,400
30	48	11,000	3,250
30	60	14,000	4,100

* From a Paper to the London and Southern District Junior Gas Association.

The capacities mentioned above are for removing stray iron in pieces of appreciable mass. The material is assumed to average 2 in. in depth and to cover the belt within 2 in. of each edge. The assumed belt speed corresponds to 38 r.p.m. of the separator pulley. Under these conditions the pulley can be relied upon to remove all magnetic material varying in size from that of a carpet tack up to 50 lb.

A special separator pulley installed at the Company's works is 36 in. diameter for a belt 48 in. wide, running at 46 r.p.m. The D.C. watts are 12,000 with a depth of coal of 3 in. It is possible to extract a mass of 125 lb. of iron from the stream when handling 16,000 cu.ft. of coal per hour. This pulley was designed to replace the original head sheave of the conveyor. The supply to this point was 3-phase, 440 volt, 50 cycles, and the site rendered any alternative means of producing D.C. impracticable, therefore, a small constant field generator was driven from the main shaft by a vee-rope drive, the necessary speed adjustment being obtained by a suitable arrangement of pulleys.

Electrical Precipitation

A further electrical aid found useful in the Gas Industry is that brought by electrical precipitation, which comprises a means of applying to foreign particles such a force as will expel them from the gas with which they are associated. This process is not new, its story dating back as far as 1824. Then, however, it was only observed as another of the peculiar phenomena which electricity was constantly observed to produce, when Hohlfeld, a mathematics teacher at Leipzig, demonstrated that by connecting a wire placed in a paper smoke-filled bottle to a frictional electrical machine he could cause the smoke to disappear very rapidly. In 1850 Guitard in London made a similar independent observation on tobacco smoke, and suggested that it might have some practical applications.

Not until 1884, however, after experiments and lectures by Oliver Lodge, were patents taken out on its application to large scale industrial plant, the first in 1885, when a plant was put into operation by the Dee Banks Lead Works in Wales for the precipitation of fumes in the flues from the lead furnaces. In the above application frictional electrical machines were used to locate the electrical field. None of these patents was, however, successful in commercial practice.

By 1906, however, due to the improved methods of electrical generation, experiments were more successful, and in 1908 F. G. Cottrell, in America, patented the first successful commercial application of the process for the condensation of sulphuric acid fumes. Here a low tension A.C. supply was stepped-up by transformer to a voltage of over 25,000, commutated to an intermittent D.C. and then fed to the two sets of electrodes. From this stage further industrial applications were evolved for removing the amount of suspended and other poisonous matter from the gaseous effluents from chimneys of smelting and other works. The development of the process advanced rapidly in America, but in England progress was much slower, more attention being paid to the rectification of the high voltages.

In Germany, experiments were also being conducted by Erwin Möller. The latter co-operated with the American scientists with whom Oliver Lodge also decided to work, and the firm of Lodge-Cottrell was founded. By the end of 1925, 300 industrial precipitators were in use, while by the end of 1928 their number had increased to 2,000—both figures refer to the whole world. In 1930 world-wide co-ordination was established, leading to the reduction in costs of installations.

The objects to be gained by tar fog removal vary according to the particular application, and may include the following in a greater or lesser degree:

1. The prevention of tar fouling in ensuing mains and apparatus.
2. The increasing of efficiency and capacity of ammonia washers and scrubbers and a reduction in the outage periods due to cleaning of scrubbing surfaces.
3. The prevention of tar filming of iron oxide in purifiers which results in—
   - (*a*) Reduced back pressure.
   - (*b*) The increased efficiency in the removal of H_2S sulphuretted hydrogen.
   - (*c*) Oxide needs to be taken out less frequently for revivification, and when taken out revives more quickly.
   - (*d*) Spent oxide is still in a saleable condition because it is not fouled by tar.
4. Wash oil sludging and thickening is reduced, consequently benzole washing conditions are improved.
5. Gas drying plant reagents are free from contamination by tar and oil fog.
6. By eliminating mechanical extractors, such as Pelouze and Audouin and Livesey washers, steam consumption may be reduced, by the consequent reduction in load on the exhausters.

The plant may be considered in two separate sections—*viz.*,

- (*a*) The electrical equipment.
- (*b*) The gas treating chamber.

(*a*) The former comprises suitable means of producing a high unidirectional voltage.

There are three methods used in commercial practice, two of which depend upon a low tension A.C. supply as a starting-point; the other employs high tension direct current generators.

In the case of the first two methods, where a low tension A.C. supply is not available, a motor or engine-driven alternator must be installed to generate the A.C. The next stage requires the production of a high tension alternating current. This is done by means of a transformer having a single phase low tension alternating current, passing through a small number of turns in primary windings and by an increase in the number of turns, including a proportional increase in voltage across the secondary winding. The next stage is the rectification of the high tension A.C. to high tension D.C. There are two commercial methods of doing this.

The first is by means of a commutating rectifier. This consists of a disc divided into two segments and placed in parallel with the A.C. circuit driven by a synchronous motor, so that the commutator runs in step with the alternators supplying the primary alternating current —*i.e.*, the voltage curves coincide; they both reach their maximum and minimum voltage in synchronism. Thus a uni-directional current, but of a pulsating value, is collected by fixed brushes from the surface of the commutator as it rotates, and is led from one brush to the H.T. bus bar in the gas treating chamber and back again to the other brush.

The second consists of passing high tension A.C. through a metal rectifier. This rectifier comprises a number of elements consisting of nickel-plated iron discs, to which a coating of metallic selenium has been applied, and afterwards subjected to a series of heat treatments. The selenium surface is then coated with a thin layer of special alloy which provides a contact surface and distributes the current evenly over the working material. This combination has the property that current will flow easily in the direction from the iron to the selenium, but only with difficulty from the selenium to the iron. This might be a little difficult to picture in your minds at first sight, but remember that we are dealing with an alternating current—that is, one which reverses its direction 100 times every second, if on a 50-cycle supply. The voltage curve in alternating current work is practically a sine curve, so that for only half the time is it flowing in the same direction. The rectifier element in its simplest form only permits half-wave rectification, but by a suitable combination full-wave rectification can be obtained. As I have said, the current flows easily from iron to selenium, but not easily from selenium to iron; copper oxide is used instead of selenium in some types and the action is similar.

The size of the disc elements vary according to the current which the rectifier is required to carry and combinations of discs in series and parallel are used to build up rectifier units for any voltage or current which may be desired. The discs are assembled on insulated spindles, and suitable connexions made from one disc to another to ensure good electrical contact between the alloy layer on the face of the discs. In some forms of rectifier this is in the form of a lead washer, while in others spring washers are used. Radiating fins are also inserted to assist in cooling.

Such rectifiers are built to work on voltages up to 70 kV, and in order to reduce the bulk which would be necessary if air cooling were used, they are now mounted in sections on insulation and enclosed in a tank filled with oil. They are not unlike a transformer tank externally.

The third method of providing the high tension D.C. is by a simple generator set comprising two self-excited H.T., D.C. generators driven in line and connected in series. The prime mover may be an A.C. or D.C. motor, or turbine, reciprocating engine, or gas engine. The output voltage is regulated by controlling speed of prime mover or by regulating the generator fields. Special precautions must be taken to insulate prime mover from generators, and also generators from earth, and screening arrangements must satisfy fully Home Office Requirements. 25 kV. is the normal operating voltage of such sets, however, whereas 40 to 70 kV. can be obtained with rectifier equipment. Protection is afforded the electrical circuit by means of no-volt and overload time lag releases on the incoming circuit breaker, and an auxiliary contact closes an alarm circuit so that audible (Klaxon) and visible (coloured lights) warnings are given should the H.T. supply fail.

The no-volt release is also connected in series with a thermostat in the rectifier tank so that current is automatically cut off in the event of excessive temperature rise.

The screening arrangements in the switchgear and bus-bar compartments are designed to make the whole of this part of the apparatus fool-proof—*e.g.*, by a system of interlocks access cannot be gained to the bus-bar chamber or any exposed conductors while the current is on, nor can cubicle doors be opened until current is switched off, and cannot be switched on again until the cubicle doors are closed.

At the gas treater end the lead-in insulators are large, so as to prevent flashes-over due to the high voltage, and here again a system of interlocks prevents access to the top of the treater or near the lead-in insulators while the current is on.

The gas treater itself consists essentially of a mild steel vessel containing a heavy mild steel plate from which a number of 6 in. diameter tubes are suspended, the number of tubes and the dimensions of the vessel depending on the quantity of gas to be treated. The tubes and vessel are earthed to a substantial copper earth plate. These tubes form one set of electrodes. The other set of electrodes is formed by single nichrome, or similar corrosion fatigue resisting alloy steel about $\frac{3}{16}$ in. diameter being suspended through the axis of each tube, and supported from above by an insulated framework. Special precautions are taken to ensure that the large insulator surrounding the support for the central electrodes, and lead-in for the high voltage connection, is kept at an even temperature to prevent moisture forming, and undue stresses due to varying temperature. The gas is admitted into the chamber under the tube plate and is evenly distributed in its passage down the outside of the tubes. By the aid of baffles placed at various levels in the treater the velocity of the gas is kept fairly even during the passage up the inside of the tubes through the electrical field, and so into the upper chamber, where it is free from tar fog.

(*Continued on p. 63*)

The outlet is near the top of the chamber. Sufficient space is left underneath the tubes to allow for the reception of deposited tar, and a manhole is provided for cleaning purposes. The accumulated tar is run off into a collecting main.

The basic factors essential for electrical precipitation are:

1. The imparting of a charge to the particles.
2. The provision of a suitable field.

Precipitation is based on the fact that when two electrical conductors, or electrodes, the one charged to a high potential and the other earthed—*i.e.*, at zero potential—are separated by a gas-filled gap, foreign particles in the gas become electrically charged as a result of the ionization of the gas, and are impelled towards the earthed electrode, on which they are deposited.

The most favourable form of discharge for precipitation is the corona or glow, this form being relatively stable and effecting a steady passage of current across a gas-filled gap. So then, when voltage is applied to the wire electrodes disposed along the axis of each tube, above a critical value, a corona discharge takes place between the wires and tube walls, the wires being surrounded by a blue glow. The tar particles expelled from the gas are precipitated on to the inner walls of the tube, and being viscous and at a fairly high temperature, run down the tube walls into the bottom of the vessel and out to the collecting main through a seal pot. It is generally accepted that if the gas is passed through the treater at its lowest temperature, a maximum removal of oil and tar fog is obtained.

Some figures given by manufacturers of the electro-detarrers show the following efficiencies of extraction with an operating pot ntial of 25,000 volts:

	Grains of tar/100 cu.ft. gas (60° F. and 30 in. Hg.).			Efficiency %
	Inlet.		Outlet.	
	109	.	0.93	99.2
	136	.	1.05	99.2
	143	.	0.96	99.3
	166	.	0.98	99.4
	168	.	0.80	99.5
	200	.	0.65	99.7
	241	.	1.20	99.5
Average	166	.	0.94	99.4

The above installation (operating on coke oven gas), was on the outlet of exhausters.

Another plant treating vertical retort gas at the inlet of the primary condensers with a normal temperature of 80° C. gave the following results:

	Grains of tar/100 cu.ft. gas (60° F. and 30 in. Hg.).			Efficiency %
	Inlet.		Outlet.	
	2,400	.	5.2	99.78
	2,500	.	7.0	99.72
	2,537	.	5.2	99.80
	2,700	.	5.0	99.81
	2,700	.	7.0	99.74
	2,750	.	4.5	99.84
	2,930	.	4.5	99.85
Average	2,645	.	5.5	99.79

The power consumption for a medium sized plant amounts to about 500 watts per 1,000,000 cu.ft. of gas/day.

One case which may prove of more than passing interest is that of a de-tarrer installed by the Company for cleaning 25,000,000 cu.ft. of producer gas per day. At the outset there was no question of its efficacy as a de-tarrer and the gas was cleaned perfectly. The viscosity of the precipitated matter, however, was much higher than of that extracted from coal gas, and it would not all run off the earthed electrodes, neither could it be washed off with the water sprays provided.

I mentioned the characteristic of "point discharge." The deposit was of such a pitchy nature that it set comparatively hard into cone-like formations sticking out from the receiving electrodes. These "growths" naturally reduced the gap between the positive and negative electrodes, thus destroying the conditions requisite for corona discharge, and the plant failed owing to the "flashes-over" which consequently occurred.

A solution to the problem has been discovered and a process evolved which completely cured the trouble without having to resort to the complications of mechanical scrapers and the like. The process, which, by the way, has a general application wherever pitchy deposits are troublesome, apart from producer gas, has been patented by the Gas Light and Coke Company, and a full description will probably be given at some future date by Mr. Dougill, who was responsible for it.

NEW PATENT

Connecting Alternative Fuel Supply Sources to Internal-Combustion Engines

A patent (No. 538,345; application date Jan. 23, 1940) granted to Parkinson & Cowan (Gas Meters), Ltd., and K. R. Green relates to devices for connecting alternative fuel supply sources to internal-combustion engines.

It is customary when it is desired to provide a fuel supply source for internal-combustion engines alternative to normal supply sources such as from a petrol carburetter, to provide a casting or pressing of T-shape, two of its outlets communicating respectively with the carburetter and the alternative fuel source—*e.g.*, gas producer—while the remaining outlet communicates with the engine inlet duct or manifold. Alternatively the casting or pressing is of L-shape, having a third opening at right angles to both limbs of the casting or pressing.

These arrangements, state the patentees, involve difficulties when applied to engines where not much space is available beneath the bonnet or engine cowling—for example, in private automobiles—and the main object of the present invention is to provide improved forms of devices in which this difficulty is eliminated or reduced.

A further object is to provide forms of such devices which will enable the alternative fuel to enter the engine inlet duct or manifold with a minimum of friction while at the same time permitting normal entry of fuel from the carburetter to take place when desired with a minimum of disturbance of the path of the fuel or mixture and/or of the normal location of the carburetter.

The invention consists in a tube or the like of flat or flattened section open at one end with a further opening in a wide face of the flat part, which part is attached or leads to the engine inlet and is mounted in the place in which a carburetter or other normal fuel supply is usually mounted, and with a still further opening to a carburetter or other normal fuel supply, which openings are preferably immediately opposite each other and with the open end leading to a supply of alternative fuel.

Fig. 1 is a sectional plan view of one convenient arrangement embodying the present invention. A two-inch tube of circular cross-section is provided at *a*, connected to a flange *c* for attachment to a throttle leading through piping to a gas producer plant (not shown). The tube is flattened at *f* where it is substantially rectangular in cross-section the two large opposite faces having openings *b d* therein and being adapted respectively to abut an engine manifold inlet flange *g* and a liquid fuel carburetter outlet flange *h*, suitable washers being interposed if desired. The inlet-manifold-flange-bolts *e* pass through the flattened end of the tube so as to retain the tube firmly in position with the longitudinal axis of the tube directed in any convenient direction for connexion to the gas producer piping, and the arrangement is such that the carburetter attachment flange is separated from the inlet manifold flange only by a distance corresponding approximately with the narrower dimension of the flattened end of the tube. If desired, as shown, the region of the studs is reinforced by suitable bushes *j* which may be integral parts of the casting or the like to prevent deformation of the flattened faces of the tube during attachment of the carburetter.

According to a modified arrangement shown, instead of providing a flattened tube a casting or pressing somewhat of T-shape is provided, the vertical outlet constituting a connexion by way of a tube to the alternative fuel source while the horizontal outlets give connexion to

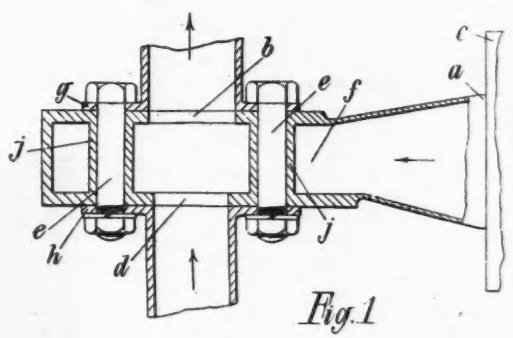


Fig. 1

the carburetter and the engine inlet duct or manifold respectively. With this construction, if desired, one of the connecting studs may pass through the duct constituting the connexion to the alternative fuel supply source.

According to a further modified arrangement a casting or pressing somewhat of banjo form is provided, the opening to the engine inlet manifold flange being through the flat side and the openings to carburetter and alternative fuel supplies being through radial ducts—securing bolts may conveniently pass through bushed holes in the casting, the mixture thus passing around the bushes to enter the engine inlet duct.

(*Text continued on p. 66*)

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Gas Products Prices

The London Market

Oct. 6.

Prices of Coal Tar Products in the London market remain at about the following levels:

Pitch nominal; creosote about 5d.; refined tar 3¾d. to 4d.; pure toluene under the Ministry of Supply Toluene No. 2 Order 2s. 5d.; pure benzole 1s. 10d.; 95/160 solvent naphtha 2s. 5d. to 2s. 8d., and 90/160 pyridine 13s. 6d.; all per gallon naked; refined crystal naphthalene £23 per ton in bags. All prices are *ex* Makers' Works.

The Provinces

Oct. 6.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 1s. 10d. (controlled by the Control of Toluene No. 2 Order, July 5, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 11d. to 1s. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha, North, 1s. 9d. to 1s. 10d. Creosote, *ex* works, in bulk, North, liquid and salty, 4½d. to 4¾d.; Scotland, 4¼d. to 4¾d.; low gravity, 4¼d. to 4¾d. Fuel Grade, 4d. to 4¼d. Carbolic acid, 60's, 3s. 7½d. to 3s. 9d. Naphthalene, £15 to £20. Salts, drained, £6 to £6 10s.; whizzed 72°, £7 15s.; 78°, £9 5s. Anthracene prices fixed by Controller. Heavy oil: Unfiltered anthracene oil (min. gr. 1,080), 6d. to 6½d.; filtered heavy oil (min. gr. 1,080), 6½d. to 7d.; heavy anthracene oil gr. less than 1,080, 5¾d. to 6d.

*In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10.

Tar Products in Scotland

GLASGOW, Oct. 4.

Throughput is well maintained although so far as new business is concerned the market is rather quiet.

Refined tar is still quite active at 4¾d. to 5d. per gallon for delivery in the home market, and about 3½d. per gallon for export, both f.o.r. naked.

Creosote oil finds a ready outlet at the following prices: Specification oil 5¾d. to 6d. per gallon; low gravity, 6¼d. to 7d. per gallon; neutral oil, 6d. to 6½d. per gallon; all *ex* Works in bulk.

Cresylic acid: Demand continues strong and values are approximately as follows: Pale, 99/100%, 4s. 4d. to 4s. 8d. per gallon; Pale, 97/99%, 4s. to 4s. 3d. per gallon; Dark, 97/99%, 3s. 9d. to 4s. per gallon; all *ex* Works in buyers' packages.

Crude naphtha remains quietly steady at 6½d. to 7¼d. per gallon *ex* Works in bulk, according to quality.

Solvent naphtha: 90/160 grade is 1s. 8¼d. to 1s. 9d. per gallon and 90/190 Heavy Naphtha is 1s. 4½d. to 1s. 5½d. per gallon.

Pyridines remain without interest at about 14s. per gallon for 90/160 grade and 16s. per gallon for 90/140 grade.

A **Good Report** has been received by cable from the head office in Melbourne of the Colonial Gas Association, Ltd., regarding the operations during the year ended June 30. The net profit for the year is £91,972, as compared with £89,435 for the preceding twelve months. The dividend on the ordinary shares is unchanged at the rate of 6% per annum. The quantity of gas sold shows an increase of 18.5% over the preceding year, the corresponding increase in the quantity sold by subsidiary gas undertakings being 6%. There has been a serious rise in costs generally due to increases in wages and in the cost of coal.

Gas Stocks and Shares

Markets opened with a brighter tone last week, particularly so after Mr. Churchill's speech, and there were signs of a broadening of business. The chief feature throughout the week was the strength of oil shares, which were the most active group in the House. There was not quite so much business in British Funds, although prices were well maintained. Home rails were slow starters, but more enquiries were reported towards the close. A firm tone was displayed by the Industrial market, and here again more business was noticeable at the end of the week, Shipping shares being strong features, while slightly firmer prices were quoted for many of the leaders. Rubber and tea shares were quietly steady.

There was also a little more business in the Gas Market last week, especially among the "ordinaries," and it will be seen below that several of these, headed by Gas Light units with a rise of 3d. to 13s. 6d., registered small gains. Bombay £1 shares, to which reference was made last week, closed 1s. higher, at 22s.

The report and accounts of the Colonial Gas Association Limited, referred to elsewhere in this issue, indicate a successful year's working. The Directors are recommending a final dividend of 3% on the ordinary shares for the year ending June 30, 1941, making 6% for the year.

The following is a complete list of price changes compared with a week ago:

OFFICIAL LIST			
Bombay £1 shares	21/—23/-	+1	
Colombo 7 p.c. Pref. (x.d.)	18/6—19/6	Sept. 29	
Colonial Gas Association Ord. (x.d.)	14/—16/-	,,	
,, ,, 8 p.c. Pref. (x.d.) ...	19/—21/-	,,	
Gas Light Units	13/—14/-	+/-3d.	
,, 3½ p.c. max.	47—52	—1	
SUPPLEMENTARY LIST			
Uxbridge 5 p.c. Deb.	97—102	+2	
PROVINCIAL EXCHANGES			
Liverpool Ord.	94—96	+2	
Sheffield Ord.	110—112	+1	

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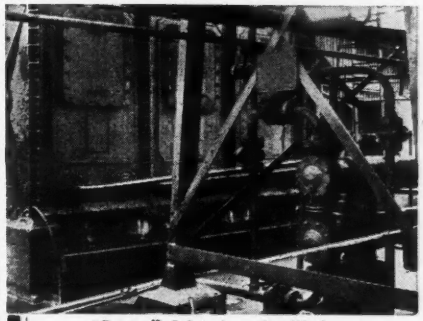
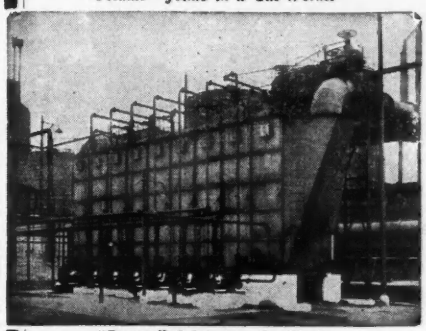
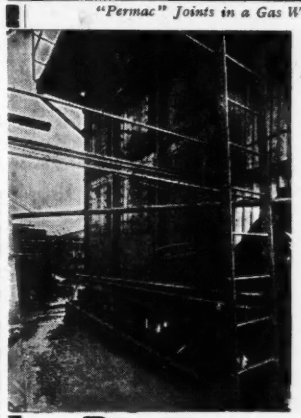


"Permac" Joints in a Gas Works.



"Permac" Joints in a Gas Works.



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GAS RESEARCH EXPANDS FRONTIERS*

REACHING NEW HEIGHTS OF ACHIEVEMENT

By R. M. CONNER,
Director, American Gas Association Testing Laboratories

IMPROVEMENT in domestic gas appliances and commercial and industrial utilization of gas been so gradual and has except in some cases, so devoid of spectacular accomplishments that the remarkable progress which has taken place in recent years is not fully appreciated. Yet, within the last fifteen years more progress has been achieved in the Gas Industry than in the past fifty. Some of the tangible improvements attained in this period have resulted in safer, more efficient, and dependable gas-burning equipment. Fifteen years ago a high percentage of gas appliances would not comply with combustion and performance standards now commonly accepted. This high level of operation has been brought about by application in manufacturing processes of scientific principles largely developed by research.

No one can deny this record of achievement. It accounts, no doubt, for the steady increase in domestic gas users since 1933, as well as the more rapid increase in commercial and industrial gas loads through adverse times, depressions, and recessions, in spite of increasing competition from competitive fuels. New uses for gas are being found almost daily. Furthermore, new developments and improvements point to better gas appliances and better gas service. Based on research, the frontiers of our Industry's future have been greatly extended. Moreover, the tempo established in this period of progress is being carried on with greater vigour than ever before.

Many agencies have been engaged in investigating problems relating to gas appliances, gas production, distribution, and utilization. Through the American Gas Association, gas companies and gas appliance manufacturers have co-operated in promoting research for their mutual benefit and in behalf of their consumers. With establishment of the American Gas Association Testing Laboratories in 1925 it was only natural that they should become the centre of these investigations.

Nearly three-quarters of a million dollars have been expended in research investigations conducted at the Laboratories since their inception. A large volume of timely, important, and useful studies has been completed. Since 1925 more than 500 fundamental reports and some 37 major bulletins have been provided. These have frequently been judged as outstanding contributions to the Gas Industry. The data obtained and the conclusions reached have been of enormous value in themselves. Studies on mixing of gas and cast-iron pipe joints represent two outstanding examples. In the commercial field data secured on costs and values of different fuels for cooking and water heating serve to apprise our Industry of its competitive advantages and disadvantages. The lack of merit of numerous gadgets purported to be "gas savers" has been exposed.

Under supervision of the Committee on Industrial Gas Research, F. J. Rutledge, Chairman, four extensive projects summarized in six bulletins have been prepared on combustion phenomena in industrial processes under high temperature conditions. This work has covered primarily combustion of gas with oxidizing atmospheres. It has involved the development of new techniques which have proved invaluable in modern industrial practices.

Recently the first bulletin on combustion of gas under reducing conditions was published, summarizing the last three years of investigation on this problem. This is entitled "Composition of Furnace Atmospheres Resulting from Partial Combustion of Gaseous Fuels," Bulletin No. 11. Data presented therein have already been put into use in preparation of special furnace atmospheres in speeding up processing of metals, thereby extending the use of industrial gas in many new fields. Additional possibilities are revealed by this study. As a result, further investigations along lines indicated by this preliminary work are now under way.

Domestic Gas Research

In 1935 a noteworthy programme of research on domestic gas appliances was inaugurated by the Committee on Domestic Gas Research, also headed by Mr. Rutledge. Already much valuable fundamental information has been presented in four major bulletins on gas ranges, water heaters, and atmospheric burner design. These have been enthusiastically received both in the United States and abroad. Continuation of this programme and its extension to cover other major domestic gas appliances are in progress.

Assisting the Committee on Domestic Gas Research in supervising the various projects on domestic gas appliances are a number of technical advisory committees appointed by the Association of Gas Appliance and Equipment Manufacturers.

One of the most outstanding projects in this entire programme is a study of gas range top burners. A considerable number of improvements in contemporary range top burners have resulted from closer control of such factors as secondary aeration, closer spacing of burners to utensils, decrease of metal thickness of grates, reduced contact of pan and grate with top surface, improved injection tubes and orifices, and horizontal drilling of ports.

An entirely different conception of burner design is the object of a current investigation. Top burners of conventional design inject 50–70% of the air required for complete combustion. They depend on secondary aeration to complete the chemical reaction for complete combustion and require additional combustion space for this to take place. Burners which will inject all the air required for complete combustion as primary air offer possibilities for further advancement. They would allow exclusion of provisions for secondary air, and permit a utensil to rest practically on the burner and to operate with increased thermal efficiency.

Results of preliminary investigations on 100% primary air injection burners have thus far proved promising. Ten out of sixteen burners designed for this purpose injected more than 100% of the air required for complete combustion, the percentage ranging from 100 to 200. While this work is by no means completed and all the difficulties have not been eliminated, some of the designs studied lend themselves to future application. It is believed that proper combination of improved mixing tubes, port arrangement, and rating hold the key to new and more satisfactory designs.

A second study now under way supplements the work summarized in Bulletin No. 10, "Fundamentals of Atmospheric Gas Burner Design," published in March, 1940. In this bulletin our general knowledge of design of small burners, satisfactory flame characteristics, good primary air injection, and quiet burner operation was materially advanced. It did not, however, cover special problems relating to larger and longer burners which are commonly used in space heaters, large water heaters, and central heating equipment. Technical knowledge of flexibility of burner performance indicated by satisfactory flame characteristics for these important applications is essential. This includes such variables as form and arrangement of ports with respect to each other, depth, size and spacing of ports, and burner head and air-gas mixture temperatures, all of which are primary factors controlling lifting, flash-back and yellow tip limits. Such information will enable a designer to evaluate these inter-related variables to secure better performance.

Water Heating Investigation

Popular interest created by Bulletin No. 9, "Fundamentals of Gas Water Heating," has indicated the need for still further clarification of problems in water heating. Active work on one of these problems, stratification of hot water in storage type heaters, was initiated late in September, 1940. Sufficient data have now been obtained to warrant its discussion. Theoretically, if perfect stratification were obtainable, the maximum hot water which could be withdrawn from a vessel would approach its storage capacity. Actually, however, inter-mixing of the hot water with cold water reduces outlet water temperatures. To obtain the amount of hot water theoretically available, it would be necessary to resort to a larger storage vessel.

Other practical aspects of benefits derived from proper stratification are those of thermal efficiency and corrosion. It has been shown in previous work that in heating water from 75 to 165°F., efficiencies of modern heaters range as much as 8% higher than those obtained when heating water from 120 to 165°F. It is further known that improper stratification is correlated with increased corrosion in water heaters. Agitation within the storage vessel causes oxygen in the cold inlet water to be thrown out of solution and deposited on the metal surfaces of the storage vessel. Moreover, it also tends to wash off protective films of hydrogen, alkaline salts, and rust formations, which if undisturbed might retard further corrosion. Thus, the advantages of obtaining satisfactory stratification of hot storage water from cold inlet water are apparent.

It was determined in this investigation that inter-mixing of hot and cold water is more pronounced with shorter dip tubes in relation to the height of the storage vessel. The effect of average water-line pressures is not appreciable. However, as the rate of drawing water is increased, the percentage of stored heat delivered in usable form is decreased. One of the tangible conclusions reached during the tests conducted to date indicates that the direction of inlet water entering the storage vessel can be controlled, thereby influencing to some degree stratification. It is believed that service efficiencies can be increased and propensity of water heaters to corrode decreased by suitably controlling this factor.

Other Projects

The work described above by no means covers all the projects now under way. Fundamental studies on range top burner lighting will afford considerable information on limiting factors of automatic lighting, when completed. Those on space heaters and central heating gas appliances include such factors as design and heat transfer, as well as noise of operation. In the study of noise, a relatively unexplored field, methods are now being developed for determining not only the intensity of noises but their source.

The Laboratories' research staff now totals sixteen, the largest number in their history.

* From the *American Gas Association Monthly*.